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Incorporating Affective Bias in Models of Human Decision Making

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Research on human decision making has traditionally focused on three issues: (1) process or how people actually make decisions, (2) quality or how good their decisions are, and (3) improvement or can decision behavior be made better. Despite a rapid growth in decision making research over the past two decades, theoretical and empirical work has been narrowly driven by models incorporating some form of the maximization of expected utility principle. For example, according to the current leading model, Kahneman and Tversky's [2] Prospect Theory model, alternatives are evaluated as a function of the psychological values of the outcomes of the decision alternatives multiplied by the subjective weights assigned to the corresponding probabilistic events that determine them.

Recent research suggests that this model is inadequate. Affective as well as cognitive components drive the way information about relevant outcomes and events is perceived, integrated and used in the decision making process. At least four categories of affective influences have been identified and studied including how the individual frames outcomes as "good" or "bad", whether the individual anticipates regret in a decision situation, the affective mood state of the individual, and the psychological stress level anticipated or experienced in the decision situation. A focus of the current work has been to propose empirical studies that will attempt to examine in more detail the relationships between the latter two critical affective influences, mood state and stress, on decision making behavior.

A second and equally important purpose of the research is to develop an experimental paradigm that goes beyond the traditional gambling or investment context in the decision making literature. One important complex environment that is rich in decision making and is well-suited for this type of research is that of flight. In addition to providing obvious face validity to the research, the many subtasks of flight make it particularly useful for studying the impact of workload and stress on decision making. A particularly useful tool for doing the research is the Multi-attribute Task Battery developed by Comstock (see Arnegard & Comstock [1]) at NASA LaRC. The MAT is a PC-based battery of tasks that incorporates activities analogous to those performed in flight. Figure 1 illustrates the video monitor display of the tasks included in the MAT -- monitoring, tracking, auditory communications, and resource management.

Proposed Studies

Study 1 will attempt to calibrate the subtasks on the MAT according to their perceived levels of mental workload. In particular, approximately four levels of difficulty of each subtask will be developed. Individuals will be asked to evaluate combinations of the subtasks according to perceived levels of mental workload. Subjects' judgments will be scaled to obtain a standard baseline measure of workload levels that we and others may use to study workload in flight.

Study 2 will be an attempt to examine the effects of positive and negative affect or mood on MAT performance. In particular, we are interested in whether strong differences that have been previously found in the decision making behavior of people in good and bad moods will generalize to decision strategies used in this kind of monitoring task.

Study 3 will examine the effects of workload level on decision strategy in the monitoring task. We are interested in both the effects of very low sustained levels of workload (boring tasks) and very high levels. We hope to determine what comprises an optimal level of workload and whether this level might produce a "natural" positive affective state. Similarly, we will attempt to determine if very low and very high workload lead to different types of negative affect and/or stress. Is the effect of boredom or very low workload comparable to what has been labeled ambient stress -- stress due to variables independent of the task? Does it lead to fewer decision alternatives being examined and to more inconsistency in decisions? An additional component of Study 3 would be to vary training on the resource management subtask in an attempt to manipulate expertise.

A number of additional studies are being proposed in conjunction with anticipated results from the first three. The actual designs of these studies will become clearer as data becomes available.

References

1. Arnegard, R. J., and Comstock, J. R. "Multi-Attribute Task Battery: Applications in Pilot Workload and Strategic Behavior Research." Paper presented at the 6th International Symposium on Aviation Psychology, Columbus, Ohio, May, 1991.

2. Kahneman, D., and Tversky, A. "Prospect Theory: An Analysis of Decisions Under Risk." Econometrika, 47, 1979, 263-291.

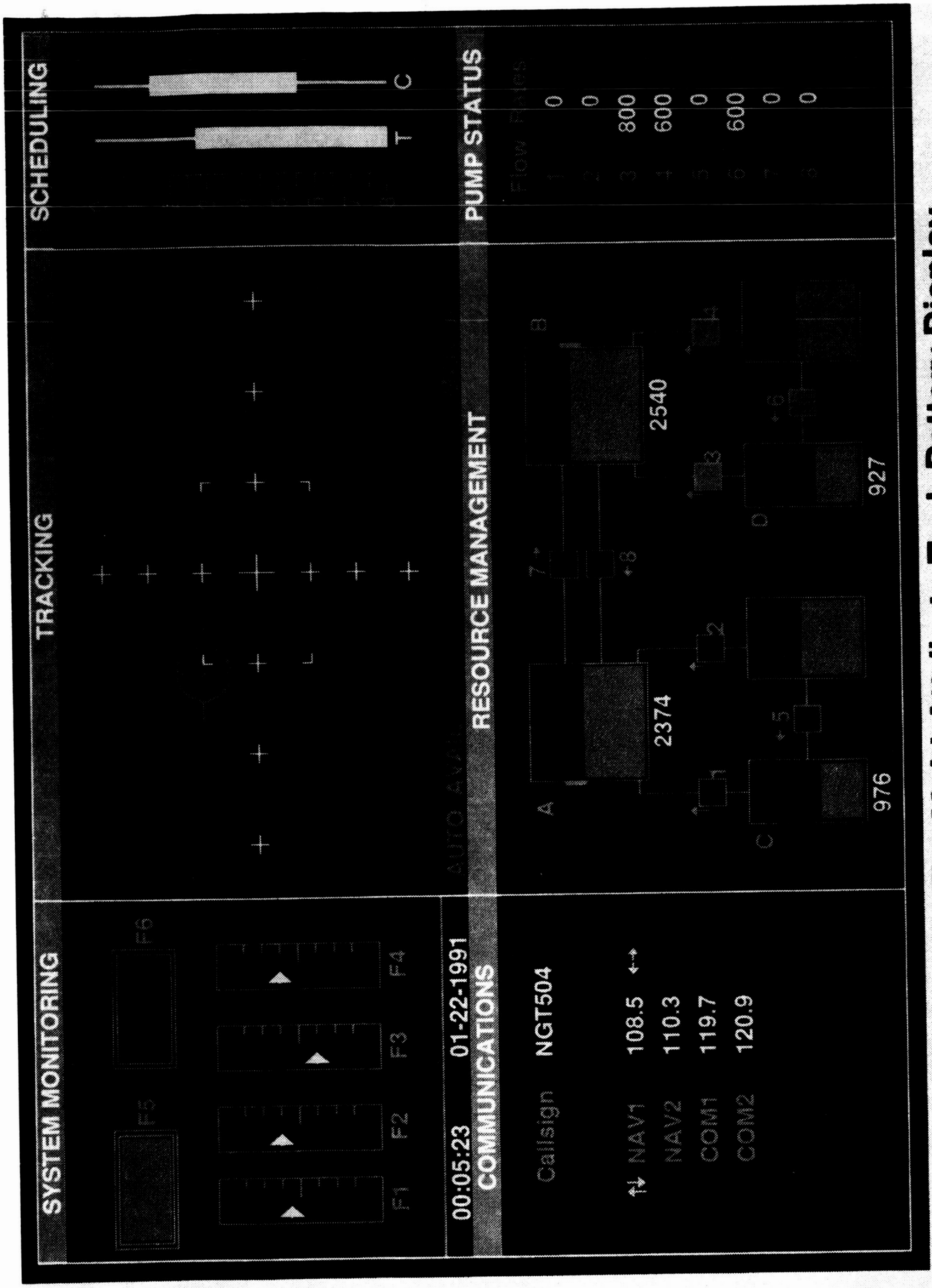

Figure 1. The Multi-Attribute Task Battery Display